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New fossil species of *Ragas* Walker (Diptera: Empididae) in Baltic amber (Tertiary, Eocene)

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Abstract. Five species of *Ragas* from Baltic amber are described (*R. baltica* sp. nov., *R. electrica* sp. nov., *R. eocenica* sp. nov. *R. succinea* sp. nov., *R. ulrichi* sp. nov.). These are the first definitive fossil species of *Ragas* described. A key to species is provided and relationships of the fossil taxa to extant species are discussed.

Key words. Diptera, Empididae, *Ragas*, new species, Baltic amber.

INTRODUCTION

Ragas Walker (Diptera: Empididae) is a small, rarely collected genus, and includes six described extant species (Sinclair & Saigusa 2001). *Ragas* is assigned to a primitive empidoid clade (*Ragas* group), which also includes *Zanclotus* Wilder, *Dipsomyia* Bezzi, *Hydropeza* Sinclair, and *Hormopeza* Zetterstedt (Sinclair 1999; Sinclair & Cumming 2006). Support for the monophyly of this genus group is based on the apomorphic similarities of the phallus, a stout and posteriorly arched labrum present in at least females, and an apical epipharyngeal comb (Sinclair 1999). This clade was assigned as *incertae sedis* within the family Empididae (Sinclair & Cumming 2006), but was not raised to subfamily level due to uncertainties concerning the definition of the Empididae. In molecular phylogenetic studies, the genus *Hormopeza* was assigned along with several other genera as sister to the remaining Empididae (Moulton & Wiegmann 2007).

Adults of the European species, *R. unica* Walker, have been observed clustered and mating on tree trunks, about one metre above the ground (Collin 1961; Qvick 1985). These observations were made in a small hardwood woodlot, surrounded by cultivated fields, lawns and gardens (Qvick 1985). This tree trunk behaviour likely explains why the empidid species described in the present study have been found in Baltic amber.

A first fossil species of *Ragas* in Baltic amber (*Ragas generosa*) was described by Meunier (1908), but this species was subsequently transferred to a possible new genus (Sinclair & Saigusa 2001). In the revision of extant species of *Ragas*, Sinclair & Saigusa (2001) briefly mentioned the discovery of two congeneric species from Baltic amber. In this study these species, along with additional material of species of *Ragas* in amber, are described and illustrated. These specimens represent the first definitive fossil species of *Ragas* and their relationships to extant species are discussed.

MATERIALS AND METHODS

The pieces will be deposited in the amber collection of Dr. Hans Ulrich at the Zoologisches Forschungsmuseum A. Koenig (ZFMK), Bonn, Germany and the Hoffeins amber collection (CCHH) of the Senckenberg Deutsches Entomologisches Institut (SDEI), Müncheberg, Germany. Amber pieces in the Hoffeins collection with *Ragas* inclusions were selected from material purchased from different sources over a period of 20 years. Dr. Ulrich obtained amber specimens exclusively from Dr. Andrey Krylov (Sea Venture Bureau Ltd., Kaliningrad, Russia) who offered inclusions sorted to Empidoidea.

Amber pieces from the ZFMK collection were prepared for identification as follows: the amber was cut and polished using an IsoMet® Low Speed Saw (Buehler, Lake Bluff, Illinois, USA) cutting machine and a Phoenix® Beta Grinder-Polisher (Buehler) polishing machine with SiC grinding paper for metallography, grit 800, 1200 and 2500, Microcut® Abrasive Paper (Buehler) plain backing P 4000, and paperboard. To protect holotype of the new species the piece was embedded in synthetic resin Araldite® 2020 (XW396/XW397) (Huntsman Advanced Materials, Everberg, Belgium) (Sinclair 2010). Specimens from the Hoffeins collection were treated in a similar way and embedded in GTS-polyester resin (Voss Chemie) (Hoffeins 2001).

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Photographs (Figs 2–4) were taken with a Nikon Coolpix 4500 digital camera attached to Wild M3Z and Leica DMLS stereo-microscopes. Photographs were edited with IrfanView and Photoshop. Photographs (Figs 1, 5, 6) were taken with a Canon EOS 4OD digital camera using a 65mm 1–5x macro lens and ring LED lighting. Multiple images were staked and montaged using Auto-Montage by Syncroscopy and edited with Photoshop.

Terms used for adult structures follow McAlpine (1981), Stuckenberg (1999 – antennae), and Saigusa (2006 – wing venation). In the system outlined by Saigusa (2006), the dipteran vein A_1 (as used in McAlpine 1981) is homologized with the mecopteran CuP, and consequently CuA_1 (of McAlpine) is termed M_4, CuA_2 is CuA, the anal cell is cell cua, and the anal vein (A_1+CuA_2) is CuP+CuA. Homologies of the male terminalia follow Sinclair and Cumming (2006).

Genus *Ragas* Walker

Ragas Walker, 1837: 229. Type-species: *Ragas unica* Walker (monotypy).
Rhagas Agassiz, 1847: 320. Unjustified emendation.

Diagnosis. *Ragas* is defined by short spine-like setae on the postgena, fore coxa and trochanter, recurved labrum, and subapical laterally projected surstylus (Sinclair & Saigusa 2001).

Ragas baltica sp. nov. (Figs 7, 8)

Type material. **Holotype** female in Baltic amber, with following label data: "HOLOTYPE/ Ragas/ *baltica*/ Sinclair & Hoffeins"; "CCHH 1458–2" (SDEI).

Amber with inclusion embedded in a rectangular polyester block 16x10x4 mm; inclusion badly preserved, left side totally milky, wings in resin layer, venation partly obscured, surface of body lacerated and thus chaetotaxy of mesonotum difficult to detect. Syninclusion: stellate hair.

Recognition. This species is distinctive with four setae near the base of the fore femur.

Description. **Female**. Body length 2.4 mm, wing length approximately 2.5 mm. **Head**: Dark brown. Dichoptic, bare. Frons at inner margin of eye with three setulae; ocellar triangle dorsal, with pair of short anterior ocellar setae and shorter and weaker posterior pair; two long vertical setae; occiput with scattered short setae Postgena with cluster of black, spine-like setae. Proboscis with labrum strongly bent backwards, as long as width of eye, with tip nearly touching fore coxa. Antennal postpedicel bulbous and tapered apically (Fig. 7), stylus 2-segmented with short, apical sensillum; length of stylus two-thirds length of postpedicel. **Thorax**: Dark brown. Two notopleurals, one supra-alar, one postalar, acrostichals present, seven dorsocentrals, anterior setae stronger and longer than posterior setae; apical setae on scutellum visible. **Wing**: Radial fork present, V-shaped. **Legs**: Brown. Anterior face of fore coxa with rows of irregularly arranged, strong, erect black setae of nearby equal length; trochanter with ten strong, black spine-like setae, varying in length, lowermost longer than width of femur; fore femur with four stout setae near base, of equal length, as long as width of femur (Fig. 8), 4th seta shorter than preceding, apex slightly bent downwards; fore tibia with row of anterior and posterior short setae, bent downwards, and with interadjacent erect micro-setulae; mid and hind femora lacking outstanding setae; mid tibia with short, regularly arranged setae; hind tibia with row of anterior and posterior short setae, bent downwards, and with interadjacent erect micro-setulae. Apical tibial comb present on fore and hind tibiae. **Terminalia**: Obscured by wings.

Etymology. The specific name is in reference to the geographic origin of the amber species, the Baltic region.

Remarks. This female specimen in Baltic amber is apparently not conspecific with any known species, recognized by the spine-like setae of the postgena, fore coxa and fore femur, and V-shaped radial fork. Describing a new species based on a single female is problematic. The chances of discovering a male with the same combination of characters present as in the female are a matter of coincidence. If a male is discovered in the future, with certainty the diagnostic feature of four distinct setae on the fore femur will be present.

Ragas electrica sp. nov. (Figs 1, 9, 10)

Type material. **Holotype** male in Baltic amber, with following label data: "HOLOTYPE/ Ragas/ *electrica*/ Sinclair & Hoffeins"; "CNC DIPTERA/ #12255" (ZFMK). **Paratype**: 1 female, #12256 (ZFMK).

Holotype embedded in 6.5x6.4x4 mm block; milky coating on right side partly obscuring thorax and terminalia. Female paratype embedded in 6x6x4 mm block; in good condition, except air bubble on right side partially obscuring posterior region of head, thorax and anterior segments of abdomen.

Recognition. This species is distinguished by dichoptic male, stylus two-thirds length of postpedicel, auxiliary crossvein between R_4 and R_{2+3} lacking, wing with well developed and rounded anal lobe, fore femur with three basal setae, male mid femur with two long ventral setae, male terminalia enlarged, broader than abdomen and held upright.

Figs 1–6. Habitus and male terminalia photographs of Baltic amber species of *Ragas*. **1.** *R. electrica*, male. **2.** *R. succinea*, female. **3.** *R. eocenica*, male. **4.** *R. eocenica*, male terminalia. **5.** *R. ulrichi*, male, right side. **6.** *R. ulrichi*, male, left side. Scale bar = 1.0 mm, except Fig. 4 where scale bar = 0.25 mm.

Description. Wing length 1.9–2.3 mm. **Male. Head**: Dark brown. Dichoptic, bare; upper facets not enlarged. Frons very broadly V-shaped; lacking setulae. Ocellar triangle dorsal, with pair of short ocellar setae and posterior pair lacking; upper postocular setae similar in size to ocellar setae. Postgenal spine-like setae present. Postpedicel with bulbous base, 2x length of base; stylus broad, approximately two-thirds length of postpedicel. Proboscis view obscured. Antennal postpedicel bulbous and tapering apically, stylus 2-segmented with short apical sensillum (Fig. 9); stylus nearly two-thirds length of postpedicel, 2nd segment more than twice length of 1st segment. **Thorax**: Dark brown. Mesonotal setae mostly short and inconspicuous; acrostichals ? uniserial; 7–8 uniserial dorsocentral setae, prescutellar seta long and stout; one short postpronotal seta; several short presutural supra-alar setae; one long and stout upper notopleural seta; one postalar seta; two pairs scutellar setae, apical pair longest. **Wing**: Pigmentation and cloudiness not visible; anal lobe well developed, broadly rounded. Radial fork V-shaped, branching near mid-length of M_1; auxiliary crossvein between R_4 and R_{2+3} lacking; cell dm broad, extended apically less than half length of cell. Apex of cell cua slightly rounded; anal vein (CuP + CuA) obscured. Pterostigma not visible. Halter light brown. **Legs**: Light brown. Anterior face of fore coxa with at least six long, erect spine-like setae. Anteroventral and ventral face of fore trochanter with some eight long, erect spine-like setae, several longer than setae on base of fore femur. Fore femur with three stout, anteroventral setae near base (assumed one seta lost on left femur), after which femur slightly attenuated, setae nearly subequal to width of femur. Mid femur with two stout posteroventral setae beyond midlength, 1.5–2.0x longer than width of femur. Mid tibia lacking modified setae opposite seta on femur. **Terminalia** (Fig. 10): Held upright, broader than width of abdomen, unrotated. Hypandrium subequal in length to epandrium. Phallus long and membranous, projecting beyond terminalia along ventral margin of hypandrium. Epandrium U-shaped, lamella broad laterally with broad apex. Cercus view obscured.

Female. Similar to male, except lacking stout setae on mid femur. Terminalia: cercus short, slender, shorter than preceding segment.

Etymology. The specific name is from the Greek ἤλεκτρον ēlektron (amber).

Remarks. The relationship of this species to other species of *Ragas* is unknown. The details of the male terminalia are not sufficient to make comparisons.

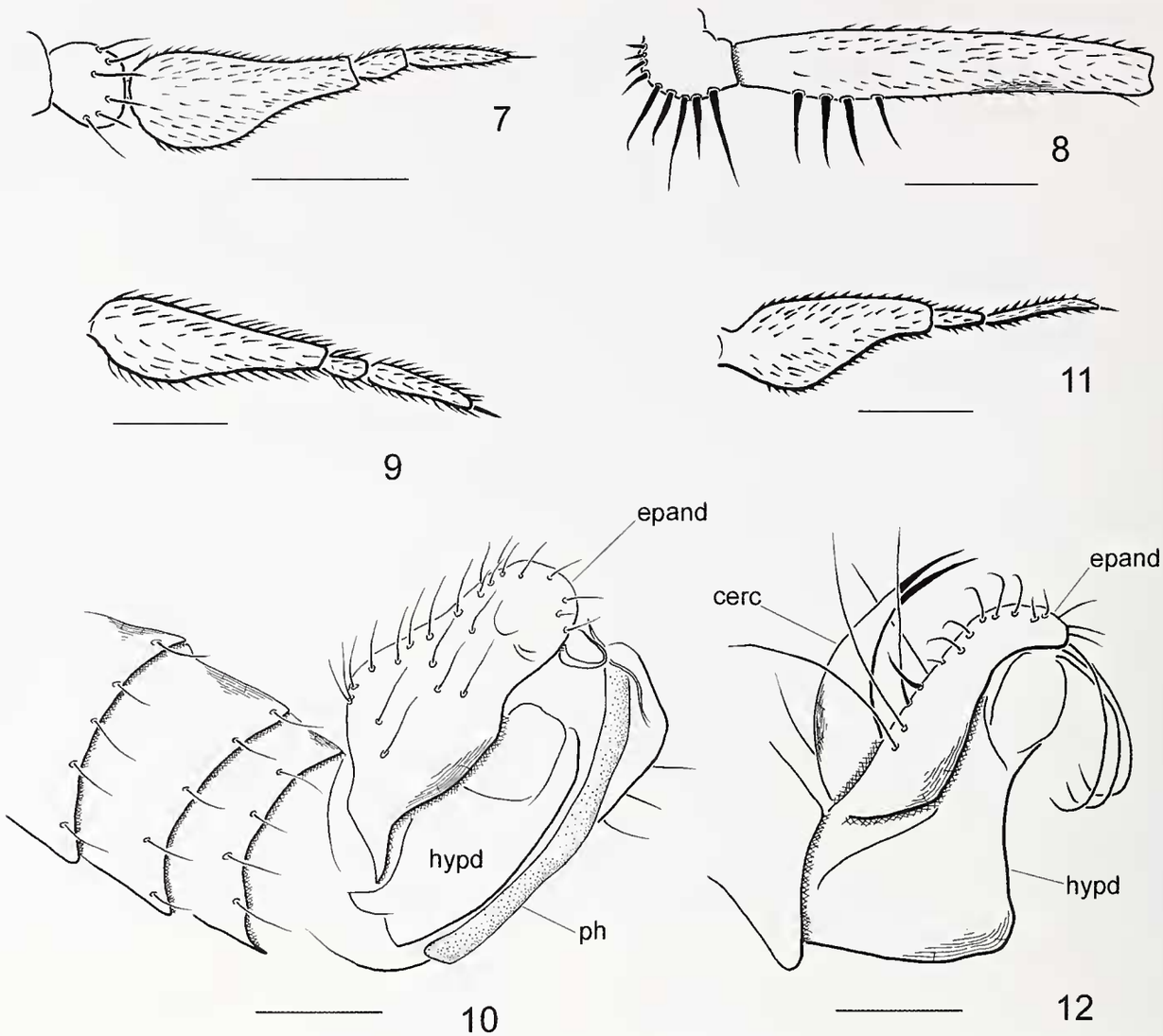
***Ragas eocenica* sp. nov.** (Figs 3, 4, 11, 12)

Type material. Holotype male in Baltic amber, with following label data: "HOLOTYPE/ Ragas/ *eocenica*/ Sinclair & Hoffeins"; "CCHH 1622–1" (SDEI).

Amber with inclusion embedded in a rectangular polyester block 14x9x5 mm. The amber piece was treated in autoclave under high pressure and heating, thus body and legs of the inclusion are shrunken and somewhat compressed laterally, cuticle partly destroyed, setae of head and thorax are visible just from lateral view, main diagnostic features not modified by autoclave treatment (Hoffeins 2012). Syninclusion: stellate hairs.

Recognition. This species is distinguished by dichoptic males, elongate and narrow wing, long and V-shaped radial fork, stylus nearly subequal in length to postpedicel, and spine-like setae on the fore coxa lacking.

Description. Male. Body length 1.7 mm, wing length 2.2 mm, width 1.6 mm. **Head**: Dark brown. Dichoptic, bare, anterior facets slightly enlarged; frons at vertex broader than above antenna, with lateral eye emargination above antenna. Frons at inner margin of eye with 3–4 setulae; ocellar triangle dorsal, with pair of short posterior and longer anterior ocellar setae; two long vertical setae; occiput with scattered long setae. Postgena with cluster of black, spine-like setae. Proboscis and labrum arched, about as long as height of head. Antennal postpedicel bulbous and tapering apically, stylus 2-segmented with short apical sensillum (Fig. 11); stylus nearly subequal in length to postpedicel, 2nd segment 2.5x longer than 1st segment. **Thorax**: Dark brown. Mesonotal setae short and inconspicuous, approximately 7–8 dorsocentrals, scutellum with one pair of apical setae. **Wing**: Auxiliary crossvein between R_4 and R_{2+3} absent; radial fork long and V-shaped (Fig. 3). Anal lobe narrow; anal vein (CuP + CuA) long, ending at end of wing margin. Pterostigma overlapping R_1. Halter brown. **Legs**: Brown. Anterior face of fore coxa without spine-like setae; trochanter with six spine-like setae, varying in length; fore femur with two (antero)ventral setae near base, of equal length, nearly as long as width of femur, mid femur with one stout, black posterior spine-like seta near apex, 2–3x longer than width of femur (legs shrunken, thus exact comparison not reliable). Fore and hind tibiae with rows of anterior and posterior short setae, bent downwards and with interadjacent erect microsetulae, setae on mid tibia inconspicuous. Apical tibial comb present on fore and hind tibiae. **Terminalia** (Figs 4, 12): Held upright, unrotated. Hypandrium longer than epandrium. Epandrium slender with arched apex; at least three anterior pairs of long setae, posterior part with several shorter, stronger and apically arched setae. Cercus with strongly sclerotized bifid tip. Phallic comprising slender filaments with coiled apex. **Female**. Unknown.



Figs 7–12. **7.** *Ragas baltica*, antenna, female. **8.** *R. baltica*, female foreleg. **9.** *R. electrica*, antenna, female. **10.** *R. electrica*, male terminalia. **11.** *R. eocenica*, antenna, male. **12.** *R. eocenica*, male terminalia. Abbreviations: cerc – cercus; epand – epandrium; hypd – hypandrium; ph – phallus. Scale bars = 0.1 mm.

Etymology. The specific name is in reference to the Eocene age of the amber species.

Remarks. *Ragas eocenica* appears to possess slender phallic filaments, also observed in the extant species, *R. circinata* Sinclair & Saigusa.

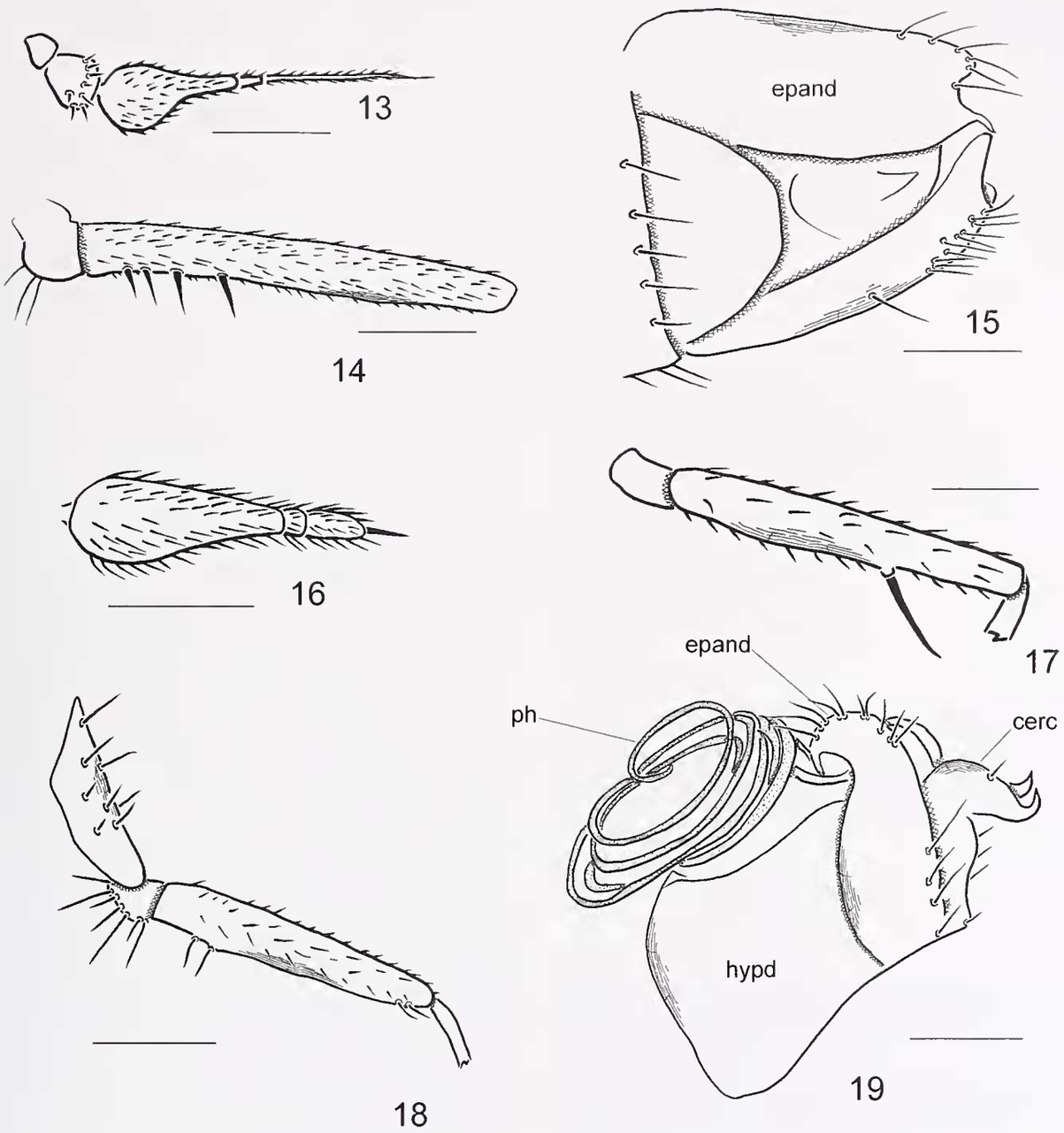
***Ragas succinea* sp. nov.** (Figs 2, 13–15)

Type material. **Holotype** male and **paratype** female in Baltic amber, with following label data: "HOLOTYPE/ Ragas/ *succinea*/ Sinclair & Hoffeins"; "CCHH 1458–1" (SDEI).

Amber with inclusions embedded in a rectangular polyester block 17x10x4 mm; abdomen in a decayed condition, distal segments of abdomen densely covered by fungi hyphen; lateral and dorsal views obscured by multi-sized air bubbles. Syninclusions: female, right side slightly obscured by milky veil; stellate hairs.

Recognition. This species is distinguished by R_{4+5} unbranched, four spine-like ventral setae near the base of the fore femur and spine-like setae of the postgena lacking.

Description. **Male**. Body length 3.4 mm, wing length 3.7 mm, broadest width 1.15–1.2 mm. **Head**: Dark brown. Holoptic, bare; upper facets enlarged. Frons lacking setulae. Ocellar triangle dorsal, with short ocellars and two pairs of upper postocular setae, outer pair slightly longer. Postgena with dense silky long setae, spine-like setae lacking. Proboscis and labrum slightly longer than face. Antennal postpedicel with bulbous base, tapered apically, tylus nearly 3x longer than postpedicel. **Thorax**: Brown. Mesonotal setae inconspicuous acrostichals and dorsocentrals present. **Wing**: Anal lobe well developed, prominent



Figs 13–19. **13.** *Ragas succinea*, antenna, female. **14.** *R. succinea*, right foreleg, female. **15.** *R. succinea*, male terminalia. **16.** *R. ulrichi*, antenna, male. **17.** *R. ulrichi*, male midleg. **18.** *R. ulrichi*, male foreleg. **19.** *R. ulrichi*, male terminalia. Abbreviations: cerc – cercus; epand – epandrium; hypd – hypandrium; ph – phallus. Scale bars = 0.1 mm.

and acute. Radial fork absent (Fig. 2); anal vein (CuP + CuA) long, ending just before wing margin. Pterostigma present. Halter pale. **Legs**: Brown. Tibiae and tarsi of fore and left mid legs broken off, visible only from ventral side; front of left fore coxa at base with two black, stout, short spine-like setae; fore trochanter with 10–12 black, erect stout spine-like setae, size variable, longest one subequal to width of trochanter; fore femur with four ventral, black, spine-like setae, shorter than width of femur. Hind tibia distally with short setae and interadjacent, erect micro-setulae. Apical tibial comb present. **Terminalia** (Fig. 15): Visible only from ventral side, terminal, not upright. Hypandrium shorter than epandrium. Epandrium with posteroventral hook-like projection.

Female. Body length 3.4 mm, wing length slightly longer than 3.4 mm, width 1.2 mm; wings not in exact plain position caused by resin flow. **Head**: Dark brown. Dichoptic, eyes bare, upper facets not enlarged, anterior ocellars short, posterior postocular setae longer, some scattered upper postocular setae longer; frons with four short setae at inner margin of eye. Postgena densely covered with cluster of silky setae. Proboscis with labrum bent

backwards, slightly longer than width of eye. Antennal postpedicel with bulbous base, tapered apically (Fig. 13), stylus 2-segmented, 1st segment short, 2nd segment 3x longer than postpedicel. **Thorax**: As in male, chaetotaxy of mesoscutum only visible laterally, dc present. **Wing**: As in male. **Legs**: Brown. Fore coxa with two black, erect, anterior spine-like setae at base as in male, slightly shorter than width of coxa; trochanter with cluster of black, erect spine-like setae, lower one 3x longer than uppermost; fore femur with four ventral black (Fig. 14), erect spine-like setae near base, shorter than width of femur. Fore tibia opposite femur with row of about 20 short, stout erect setae, length of setae decreasing to apex of tibia, row of stout setae continuing to base of tarsomere 1, short stout setae clustered at apex of tibia and base of tarsomere 1 near articulation. Hind tibia distally with short setae, bent downwards, and with interadjacent erect micro-setulae. Apical comb present on hind tibia. **Terminalia**: No clear details discernible, cerci withdrawn between tergite and sternite of terminal segment.

Etymology. The specific name is from the Latin *succinum* (amber).

Remarks. The male and female are embedded very close together, and no differences in chaetotaxy of the legs can be recognized although forclegs of the male are not complete. The male and female specimens are confidently considered conspecific.

***Ragas ulrichi* sp. nov.** (Figs 5, 6, 16–19)

Type material. **Holotype** male in Baltic amber, with following label data: "HOLOTYPE/ Ragas/ *ulrichi*/ Sinclair & Hoffeins"; "CNC DIPTERA/ #12249" (ZFMK). **Paratypes**: 2 males, 3 females, #12250–12254 (ZFMK); 1 female, #CCHH 1458–5 (SDEI), 1 male, #CCHH 1458–6 (SDEI). **Additional material**. 1 male, #CCHH 1458–4 (SDEI);1 male, #CCHH 1458–7 (SDEI); 1 female, #CCHH 1458-3 (SDEI); 1 male, #CCHH 1458–8 (SDEI).

Holotype embedded in 6x6x4 mm block; in good condition, milky coating partially obscuring thorax and back of head on right side. Male paratype (1458–6) embedded in polyester block 9x9x5 mm; partly in poor condition, milky coating obscuring partly thorax and occiput, air bubbles between mid and hind legs, inner part of mid femora hidden. Female paratype (1458–5) embedded in polyester block 13x11x6 mm; in poor condition, right side obscured by milky coating, basal segments of abdomen bloated, wings overlapping over abdomen; not all characters discernable.

Recognition. This species is distinguished by holoptic males, stylus one-third length of postpedicel, auxiliary crossvein between R_4 and R_{2+3} lacking, wing with broad anal lobe, fore femur with two basal setae, male mid femur with one long ventral seta, and long coiled and slender phallus.

Description. Wing length 1.9–2.3 mm. **Male**: **Head**: Dark brown. Holoptic, bare; upper facets enlarged. Frons lacking setulae. Ocellar triangle dorsal, with pair of short anterior ocellar setae and shorter posterior pair; two pairs of upper postocular setae similar in size to anterior ocellar setae. Postgena with broad cluster of some 10–15 spine-like setae. Postpedicel with bulbous base, 3x length of base; stylus broad, approximately one-third length of postpedicel. Proboscis with labrum slightly longer than postpedicel. Antennal postpedicel bulbous and tapering apically, stylus 2-segmented with short apical sensillum (Fig. 16); stylus nearly one-half length of postpedicel, 2nd segment twice length of 1st segment. **Thorax**: Dark brown. Mesonotal setae mostly short and inconspicuous; acrostichals ? uniserial; some 4–8 uniserial dorsocentral setae, prescutellar seta longer and stouter; one short postpronotal seta; three short presutural supra-alar setae; one long and stout upper and two shorter lower, more slender notopleural setae; one postalar seta; two pairs scutellar setae, apical pair longest. **Wing**: Pigmentation and cloudiness not visible; anal lobe well developed, prominent and acute. Radial fork bell-shaped, branching near proximal third of M_1; auxiliary crossvein between R_4 and R_{2+3} lacking; cell dm broad, extended apically less than half length of cell. Apex of cell cua truncate; anal vein (CuP + CuA) long, ending short of wing margin. Pterostigma overlapping apex of R_1. Halter brown. **Legs**: Brown. Anterior face of fore coxa with approximately 6–8 long, erect spine-like setae. Anteroventral and ventral face of fore trochanter with some 6–9 long, erect spine-like setae, several longer than setae on base of fore femur. Fore femur with two stout, anteroventral setae near base (Fig. 17), distal seta longer and stouter, after which femur slightly attenuated, setae nearly subequal to width of femur. Mid femur with stout, arched posteroventral seta at apical third, 2x longer than width of femur (Fig. 18). Mid tibia lacking modified setae opposite seta on femur. **Terminalia** (Fig. 19): Erect not projecting dorsally over abdomen, unrotated. Hypandrium U-shaped in posterior view, with thinly sclerotized ventral face. Phallus (or phallic filaments) long and coiled into at least three circles, usually lying on right-hand side. Epandrium U-shaped, apical portion of lamella slender, apex attenuated. Cercus short and broad, apparently less than half length of epandrium.

Female. Similar to male, except eyes widely separated on frons; 3–4 setulae along inner eye margin above antenna. Lacking stout seta on mid femur. Terminalia: cercus short, slender, longer than preceding segment.

Etymology. This species is dedicated to Dr. Hans Ulrich who kindly made available his rich collection of amber Empidoidea.

Remarks. This amber species is possibly related to the four extant species (*R. alpina* Sinclair & Saigusa, *R. circinata*, *R. longicauda* Sinclair & Saigusa, *R. munroei* Sinclair & Saigusa) on the basis of modified setae on the male mid femur. However, the terminalia are unrotated and held upright, but not over the abdomen, holoptic males and broad wings in the fossil species prevents assignment to this group. The coiled phallus and/or phallic filaments are similar to the coiled phallic filaments of *R. circinata*, but it is difficult to determine whether this condition is homologous.

DISCUSSION

The phylogenetic relationships of the extant species of *Ragas* were analysed by Sinclair & Saigusa (2001), where they recognized three species groups. *Ragas succinea* is possibly related to the *R. unica* group, although on the basis of plesiomorphic characters (holoptic males, male terminalia horizontal). The three remaining fossil species (*R. electrica, R. eocenica* and *R. ulrichi*) are possibly related to the *R. circinata* group on basis of dichoptic males and absence of the auxiliary crossvein. The phallic filaments observed in *R. eocenica* certainly suggest affinities with *R. circinata*. Including *R. baltica*, known only from a female specimen, the *Ragas* fauna in the fossil record is represented by three species groups as recognized for the extant fauna.

Although inclusions assigned to *Ragas* are rarely found among empidoid Diptera in Baltic amber, the study of 19 inclusions with *Ragas* specimens revealed a surprising abundance of species.

KEY TO FOSSIL SPECIES OF *RAGAS*

1. R_{4+5} unbranched (Fig. 2). ..... *R. succinea*
– R_{4+5} branched. 2
2. Fore femur with 4 stout setae near base (Fig. 19) (males unknown). ..... *R. baltica*
– Fore femur with 2–3 stout setae near base. 3
3. Radial fork long and narrow, branching near base of M_1 (Fig. 3). Fore coxae lacking spine-like setae. ..... *R. eocenica*
– Radial fork not unusually long and narrow, branching opposite mid-length of M_1. Fore coxae with spine-like setae. 4
4. Males dichoptic. Fore femur with 3 spine-like ventral setae. Mid femur with 2 spine-like ventral setae. Male with un-coiled phallus (Fig. 10). ..... *R. electrica*
– Males holoptic. Fore femur with 2 spine-like ventral setae (Fig. 8). Mid femur with 1 spine-like ventral setae (Fig. 7). Male with long coiled phallus (Figs 6, 9). ..... *R. ulrichi*

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